# Claims

1. A connection switching device for implementing Optical Channel Shared Protection Ring (Och-SPRing), which is used in nodes of an optical network system with a working path and a backup path, comprising:

two switches, each of which has two input ports and one output port, and one of the input ports can be connected to the output port under the control of the switch;

wherein, one input port of the first switch connects to a downlink direction of the working path, the other input port connects to the downlink direction of the backup path, and the output port connects to a local drop path;

one input port of the second switch connects to a local add path, the other input port connects to the downlink direction of the backup path and the output port connects to the uplink direction of the backup path; and

the local add path is connected with the uplink direction of the working path at the same time.

2. The device according to claim 1, wherein, under normal modes of the device, the input port, which connects to the downlink direction of the working path, of the first switch, is connected to the output port of itself;

under local drop modes, the input port, which connects to the downlink direction of the backup path, of the first switch, is connected to the output port of itself;

under local add modes, the input port, which connects to the local add path, of the second switch, is connected to the output port of itself; and

under express modes, the input port, which connects to the downlink direction of the backup path, of the second switch, is connected to the output port of itself.

3. The device according to claim 1, wherein, both of the switches of the device can be one of the three available combinations:

both of the first and the second swithes are optical switches; and, the first switch is an electric switch in an Optical Transformation Unit (OTU), and the second switch is an optical switch; and, the first switch is a logical switch, and the second switch is an optical switch.

4. The device according to claim 2, wherein, both of the switches of the device can be one of the three available combinations:

both of the first and the second swithes are optical switches; and, the first switch is an electric switch in an Optical Transformation Unit (OTU), and the second switch is an optical switch; and, the first switch is a logical switch, and the second switch is an optical switch.

5. A connection switching device for implementing Optical Channel Shared Protection Ring (Och-SPRing), applied in unidirectional services drop function of the node in the optical network system with the working path and the backup path, comprising:

a first switch, which has two input ports and one output port, and one of the input ports can be connected to the output port under the control of the switch; one input port of the first switch connects to a downlink direction of the working path, the other input port connects to the downlink direction of the backup path, and the output port connects to a local drop path; and

a second switch, which has one input port and one output port, and the input port can be open or close to the output port under the control of the switch; the input port of the second switch connects to the downlink direction of the backup path, the output port connects to the uplink direction of the backup path.

6. The device according to claim 5, wherein, under the normal modes of the device, the input port, which connects to the downlink direction of the working path, of the first switch, is connected to the output port of itself;

under the local add modes, the input port, which connects to the downlink direction of the backup path, of the first switch, is connected to the output port of itself; and

under the express modes, the input port of the second switch, is connected to the output port of itself.

7. The device according to claim 5, wherein, both of the switches of the device can be one of the three available combinations:

both of the first and the second swithes are optical switches; and, the first switch is an electric switch in an Optical Transformation Unit (OTU), and the second switch is an optical switch; and, the first switch is a logical switch, and the second switch is an optical switch.

8. The device according to claim 6, wherein, both of the switches of the device can be one of the three available combinations:

both of the first and the second swithes are optical switches; and, the first switch is an electric switch in an Optical Transformation Unit (OTU), and the second switch is an optical switch; and, the first switch is a logical switch, and the second switch is an optical switch.

9. A connection switching device for implementing Optical Channel Shared Protection Ring (Och-SPRing), applied in unidirectional services add function of the node in the optical network system with the working path and the backup path, comprising:

a switch, which has two input ports and one output port, and one of the input ports can be connected to the output port under the control of the switch; one input port of the switch connects to the local add path, the other input port connects to the downlink direction of the backup path, and the output port connects to the uplink direction of the backup path; wherein,

the local add path is connected to the uplink direction of the working path at the same time.

10. The device according to claim 9, wherein:

under the local add modes, the input port, which connects to the local add path, of the switch, is connected to the output port of itself; and

under the express modes, the input port, which connects to the downlink direction of the backup path, of the switch, is connected to the output port of itself.

11. The device according to claim 9, wherein: both of the switches of the device can be one of the three available combinations:

both of the first and the second swithes are optical switches; and, the first switch is an electric switch in an Optical Transformation Unit (OTU), and the second switch is an optical switch; and, the first switch is a logical switch, and the second switch is an optical switch.

12. The device according to claim 1, wherein, both of the switches of the device can be one of the three available combinations:

both of the first and the second swithes are optical switches; and, the first switch is an electric switch in an Optical Transformation Unit (OTU), and the second switch is an optical switch; and, the first switch is a logical switch, and the second switch is an optical switch.

13. An optical network system for implementing Optical Channel Shared Protection Ring (Och-SPRing), comprising a bi-directional working path and a bi-directional backup path, wherein:

a bi-directional service transmission-reception node in the system comprises two identical connection switching devices, each of which connects with the working path and the backup path of the working path in one direction by the same connection method, and each of the connection switching device comprises: two switches, each of which has two input ports and one output port, and one of the input ports can be connected to the output port under the control of the switch; one input port of the first switch connects to a downlink direction of the working path, the other input port connects to the downlink direction of the backup path, and the output port connects to a local drop path; one input port of the second switch connects to a local add path, the other input port connects to the downlink direction of the backup path and the output port connects to the uplink direction of the backup path; the local add path is connected with the uplink direction of the working path at the same time;

an unidirectional service transmission-reception node in the system comprises one connection switching device used for unidirectional service drop, and one connection switching device used for unidirectional service add;

the connection switching device used for unidirectional service drop comprises: a first switch, which has two input ports and one output port, and one of the input ports can be connected to the output port under the control of the switch; one input port of the first switch connects to a downlink direction of the working path, the other input port connects to the downlink direction of the backup path, and the output port connects to a local drop path; a second switch, which has one input port and one output port, and the input port can be open or close to the output port under the control of the switch; the input port of the second switch connects to the downlink direction of the backup path, the output port connects to the uplink direction of the backup path; and

the connection switching device used for unidirectional service add comprises: one switch, which has two input ports and one output port, and one of the input ports can be connected to the output port under the control of the switch; one input port of the switch connects to the local add path, the other input port connects to the downlink direction of the backup path, and the output port connects to the uplink direction of the backup path; the local add path is connected to the uplink direction of the working path at the same time.

14. The system according to claim 13, wherein, as to the connection switching device in the bi-directional service transmission-reception node in the system, under the normal modes, the input port, which connects to the downlink direction of the working path, of the first switch, is connected to the output port of itself; under the local drop modes, the input port, which connects to the downlink direction of the backup path, of the first switch, is connected to the output port of itself; under the local add modes, the input port, which connects to the local add path, of the second switch, is connected to the output port of itself; under the express modes, the input port, which connects to the downlink direction of the backup path, of the second switch, is connected to the output port of itself;

as to the connection switching device applied in the unidirectional service drop in

the unidirectional service transmission-reception node in the system, under the normal modes, the input port, which connects to the downlink direction of the working path, of the first switch, is connected to the output port of itself; under the local add modes, the input port, which connects to the downlink direction of the backup path, of the first switch, is connected to the output port of itself; under the express modes, the input port of the second switch, is connected to the output port of itself; and

as to the connection switching device applied in the unidirectional service add in the unidirectional service transmission-reception node in the system, under the local add modes, the input port, which connects to the local add path, of the switch, is connected to the output port of itself; under the express modes, the input port, which connects to the downlink direction of the backup path, of the switch, is connected to the output port of itself.

15. The system according to claim 13, wherein, the node of the system further comprises: at least one Optical Add Drop Multiplexing (OADM) unit, whose input port connects with the transmission optical fiber in the optical network system, and is used for dividing the optical signals input through the optical fiber according to their wavelengths, and then transmitting the signals to the working path and the backup path; and

at least one OADM unit, whose output port connects with the transmission optical fiber in the optical network system, and is used for combining the optical signals of different wavelengths output through the working path and the backup path, and then transmitting the signals to the optical fiber.

16. The system according to claim 15, wherein, the two OADM units, which connect the same optical fiber in the system, are further directly connected with each other through the transmission path, which is used for the express processing on the optical signals which have no interactions with the node.

17. The system according to claim 13, wherein, both of the switches of the device can be one of the three available combinations:

both of the first and the second swithes are optical switches; and, the first switch is an electric switch in an Optical Transformation Unit (OTU), and the second switch is an

optical switch; and, the first switch is a logical switch, and the second switch is an optical switch.

18. The system according to claim 14, wherein, both of the switches of the device can be one of the three available combinations:

both of the first and the second swithes are optical switches; and, the first switch is an electric switch in an Optical Transformation Unit (OTU), and the second switch is an optical switch; and, the first switch is a logical switch, and the second switch is an optical switch.

19. The system according to any of claim15, wherein, both of the switches of the device can be one of the three available combinations:

both of the first and the second swithes are optical switches; and, the first switch is an electric switch in an Optical Transformation Unit (OTU), and the second switch is an optical switch; and, the first switch is a logical switch, and the second switch is an optical switch.

20. The system according to any of claim 16, wherein, both of the switches of the device can be one of the three available combinations:

both of the first and the second swithes are optical switches; and, the first switch is an electric switch in an Optical Transformation Unit (OTU), and the second switch is an optical switch; and, the first switch is a logical switch, and the second switch is an optical switch.

21. A method for implementing Optical Channel Shared Protection Ring (Och-SPRing), which can be applied to the optical network system with the working path and the backup path, comprising:

controlling the first switch to receive the downlink service signals from the working path or the backup path When receiving the signals;

transmitting the uplink service signals from the local device respectively to the uplink direction of the working path and one of the input ports of the second switch when

transmitting the signals; and

controlling the second switch to choose one path of the signals from the local uplink service signals and the downlink service signals from the backup path, and input the selected signals to the uplink direction of the backup path.

22. The method according to claim 21, further comprising:

setting two switches, in the node of the optical network system, for each working path and its backup path which pass through the node, each of the switches has two input ports, wherein, one input port of the first switch connects to a downlink direction of the working path, the other input port connects to the downlink direction of the backup path, and the output port connects to a local drop path; one input port of the second switch connects to a local add path, the other input port connects to the downlink direction of the backup path and the output port connects to the uplink direction of the backup path; the local add path is connected with the uplink direction of the working path at the same time;

under normal modes, the input port, which connects to the downlink direction of the working path, is connected to the output port of itself, under the control of the first switch; the signals from the downlink direction of the backup path are input to the local drop path through the first switch; the signals from the local add path are directly input to the uplink direction of the working path;

if the node needs to enter the local drop modes, the input port, which connects to the downlink direction of the backup path, is connected to the output port of itself, under the control of the first switch; the signals from the downlink direction of the backup path are input to the local drop path through the first switch;

if the node needs to enter the local add modes, the input port, which connects to the local add path, is connected to the output port of itself, under the control of the second switch; the signals from the local add path are input to the uplink direction of the backup path through the second switch;

if the node needs to enter the express modes, the input port, which connects to the downlink direction of the backup path, is connected to the output port of itself, under the control of the second switch; the signals from the uplink direction of the backup path are

input to the downlink direction of the backup path through the second switch.

23. The method according to claim 22, further comprising: controlling the second switch to open the input port, which connects to the local add path, to the output port under the normal working modes.